The Future In Air Distribution

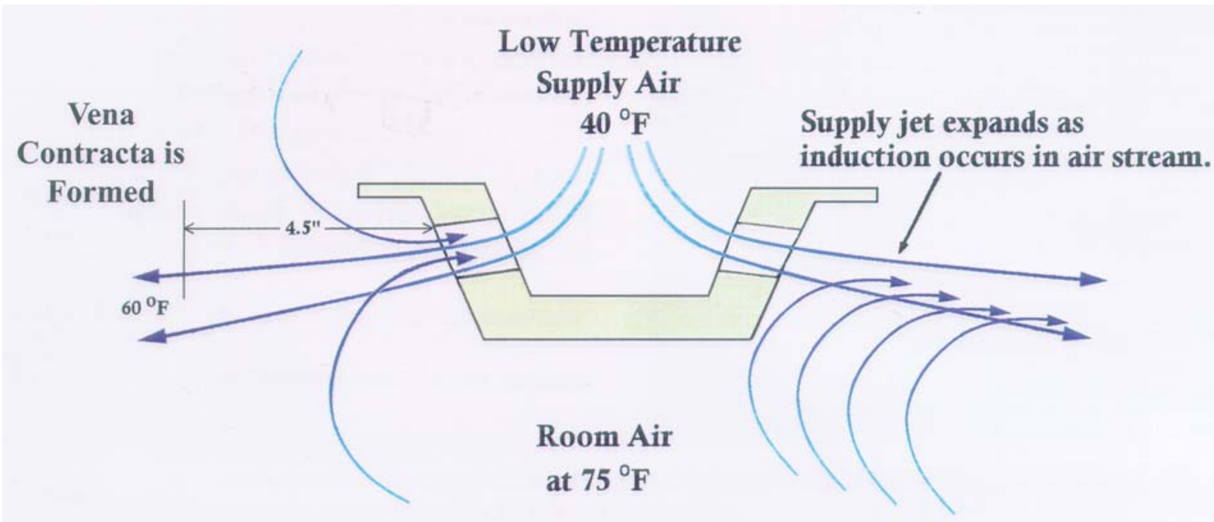
THERMAL CORE

2nd Edition

Drury College proved to be an excellent testing ground for Thermal Core cold air diffusers since the structure offered a variety of room configurations. At left, the 30 foot ceilings of the atrium posed no problem for the mixing efficiency of the diffusers.

The cold air diffuser line is another Thermal Core exclusive. Unlike conventional systems that handle 55 degree air supply, the cold air diffuser allows 40 degree or lower air to be distributed without the use of mixing boxes. The high induction ratio ensures comfort is maintained and air quality criteria are met. Users discover the benefits of cold air systems through lower initial system installation and construction costs. This is realized by a reduction in the air handling and distribution system size and the decrease of ductwork size, fans, and other system components.

Thermal Core Cold-Air Diffusers



Vena Contracta is formed pulling room air back into the jet nozzle and mixing it with the primary supply air stream. The induction accomplished through the nozzle and within 4 1/2 inches of the diffuser outlet has a ratio of 2.35:1. This means that for every CFM of supply air 2.35 CFM is introduced to the room. Induction continues throughout its throw due to the high mass and velocity of the individual circular jets. These two principles account for the very high overall induction ratio. The diagram illustrates induction of room air into the supply jets exiting a **Thermal Core**© diffuser. Room air adjacent to the supply jets is entrained into the stream, expanding the jet and transferring heat to it. Within a few inches from the diffuser, the temperature of the supply air has increased to the extent that "dumping" of cold air into the living space does not occur.

Thermal Core Research and Development

Thermal Core technology was developed by applying the latest scientific knowledge of air jet behavior. The team responsible for its development utilized data provided by the world's leading air distribution scientists. Computerized mathematical modeling was used to develop prototype models that were then tested in the most modern laboratories available. The thermal-core diffusers were subjected to the most rigorous testing and conditions possible. Thermal-imaging was used to study the exact air distribution envelope, the interaction of the primary air stream with room ambient air, and resultant thermal gradients. An array of highly sensitive air flow and temperature sensors were installed in the laboratory to form a grid system allowing the ambient room circulation, mixing and temperature gradient to be studied. An air distribution performance index (ADPI) was thus determined for the diffusers, when applied within the suggested guideline application procedures. Deviation from guideline application procedures will degrade the performance of any diffuser, but degradation can now be predicted.

Primary air temperature from 35 °F to 140 °F were introduced through the thermal core diffusers.

Room temperatures and humidity levels were varied from 35 °F to 95 °F and 25% RH to 90% RH. A cold glass curtain wall mock-up was provided in the laboratory to determine heating performance. This wall was tested down to -20 °F. Finally all thermal core diffusers were submitted to Energistics Laboratory, a division of Cerami and Associates for complete independent testing. (See end note.)

The following tests were conducted:

- ✓ Air flow, air throw, and air drop
- ✓ Sound power and NC level development
- ✓ Air pressure drop
- ✓ Induction ratio determination
- ✓ Air distribution performance (ADPI) tests
- ✓ Cold curtain wall heating test
- ✓ Complete cataloging of performance data for each diffuser
- ✓ Condensation test in a warm and humid room with cold primary air (i.e. room - 95% DB, 90% RH; primary supply air - 35% DB

These tests concluded that the Thermal Core high induction diffuser accomplishes a superior air diffusion performance index and provides the following benefits:

- ✓ Superior indoor air quality
- ✓ Superior heating performance from overhead air distribution, even in northern climates
- ✓ Complete air mixing which provides even temperature gradients throughout the space, and more importantly, the elimination of short-circuiting of the primary supply air to the return-air system. This increases the "ventilation effectiveness factor" and optimizes the effectiveness of outdoor ventilation air in achieving acceptable indoor air quality.
- ✓ The primary cold air stream will not sink (dump) into the occupied zone, even when throttled back to zero flow rate.
- ✓ Condensation problems often encountered during initial pulldown in humid areas, or with cold-air distribution systems, are eliminated.

The thermal core line of high induction diffusers is probably the most researched, studied, and tested air distribution product of our time.

End Note:

Independent laboratory testing confirmed or prevailed over the initial testing which was performed in the Titus Laboratory in Richardson, TX. All performance data and performance claims are based on the final testing in Energistic's, a division of Cerami & Associates Inc., independent laboratory.

IMAX: Branson, Missouri chooses high tech jet induction diffusers and cold air distribution for occupant comfort.

Principles of Cold-Air Distribution

Air Entrainment

Mathematical modeling and laboratory tests have proven that the application of five scientific principles are necessary to accomplish optimum ambient air entrainment.

1. The injected airstream must have adequate velocity and mass to provide sufficient momentum to cause desired circulation, entrainment, and mixing of ambient air.
2. The ratio of peripheral surface area to cross-sectional area must be high to provide maximum contact between the two air masses.
3. The ratio of the longitudinal dimension to cross-sectional area of the nozzle should be 3:1 or greater. This establishes nonturbulant, linear flow within the nozzle, which prevents diffusion of the airjet when it exits the nozzle, thereby allowing the airjet to continue its circular form for some distance into the conditioned room. A Vena-Contracta is established setting up an induction effect back into the nozzles.
4. Adequate space must be provided around the perimeter of each air shaft to allow maximum contact of the injected airstream with the ambient air.
5. The jetstream must be projected at a specific angle away from the surface it is flowing across, creating a negative pressure region between the high velocity jet and that surface. The low pressure region created must be of sufficient depth and intensity so as to cause ambient air to flow into it, thus enhancing ambient air entrainment.

Thermal Core© diffusers embody all five of these principles to a higher degree than has previously been possible.

Induction

Due to the innovative design of Thermal Core© diffusers, induction ratios are much higher than those obtained previously. Conventional diffusers offer induction ratios from 4:1 to 10:1. Thermal Core© diffusers increase the induction ratio from 200 to 400 percent. The induction ratio is cataloged for each diffuser at various air-flow rates so its performance can be easily ascertained. (See Diffuser Specifications.)

Draft-Free Operation

The Thermal Core© diffuser is unique in that it projects air away from the ceiling, allowing a low pressure region to form for a short distance. The air stream is then attracted towards the ceiling preventing it from sinking into the conditioned room, which would cause objectionable drafts. Laboratory tests have proven that **Thermal Core**© diffusers offer greater turndown ratios than are possible with other designs. In fact, no objectionable drafts will occur over the entire range from zero to 100 percent air flow.

Condensation Formation

A successful cold-air distribution system must prevent condensation from forming on the diffusers under all possible operating conditions. The thermal-core diffuser accomplishes this due to its unique design. First, all parts of the diffuser are constructed of a self-insulating material. Second, warm ambient room air is induced in such a manner as to impinge on its surfaces. This characteristic warms the surfaces adequately to prevent condensation. A Vena-Contracta is formed inducing air back into the nozzle which increases the outlet temperature further avoiding condensation formation.

Condensation formation can also occur on conventional temperature systems under certain conditions. Thermal core diffusers have solved many such conditions in the past.

Heating

The thermal-core diffusers are well suited to overhead heating systems in very cold climates. Walls with heat losses up to 500 BTUH per linear foot can be heated from an overhead air distribution system without cold down-drafts affecting the comfort of occupants. The higher induction rate again provides the circulation and mixing to prevent stagnation, down drafts, and other undesirable conditions from developing. Conventional diffusers simply do not have the induction capacity to provide a comfortable draft-free environment under these cold adverse conditions.

A cold glass curtain wall was mocked up in a weather chamber at Energistics/Cerami Associates Inc. Laboratory to ascertain exactly how well the thermal core diffusers would perform under extreme heating situations. The chamber was 20 feet wide, 24 feet long, and 9 feet high. The glass curtain wall was 20 feet wide and 9 feet tall with a 0.56 "U" factor. Temperature was -20 ^{o}F on the cold side of the wall and 75 ^{o}F on the warm side. The curtain wall heat loss was 478 BTUH per linear foot. A temperature and air-flow sensor grid was set up in accordance with ADPI standards. The maximum temperature differences within the occupied zone from head-level to floor level and throughout the entire space was less than 1.5 ^{o}F. All the velocity readings were within the acceptable range.

"ADPI" test standards have not been established at this date for heating systems, but if normal ADPI standards were applied, the rating would have been 100.

Until now, overhead heating systems could not provide adequate comfort under such adverse conditions. Even dual distribution systems with an overhead cooling system and an underfloor heating system have a hard time equaling such performance.

Now, for the first time, the HVAC engineer can confidently design a combination overhead heating and cooling air distribution system in very cold northern climates.

Cold-Air Distribution Systems and Indoor Air Quality

✳ Cold-air distribution systems provide improved humidity control enhancing the comfort that occupants perceive.

✳ The buildings are fresher and more comfortable if high induction diffusers are employed due to superior room-air mixing, greater ventilation effectiveness, and improved circulation rates.

✳ Concentrations of endotoxins (toxic substances secreted by microorganisms) are lower than in conventional systems.

✳ Condensation on cooling-coil fins is up to three times higher than conventional systems. This virtually turns the cooling-coil into an "air washer" carrying away many undesirable impurities, particles, and toxins and flushing them down the drain.

✳ Overall air quality is perceived to be superior. Owners who have used cold-air distribution in conjunction with thermal core high induction diffusers know that the indoor air quality and comfort are improved.

Outdoor Air Introduction Rate and Ventilation Effectiveness

ASHRAE Standard 62-1989, Ventilation for Acceptable Indoor Air Quality, states in Section 6, Paragraph 6.1.33 that outdoor air introduction rates must be increased if mixing provided by the building's air distribution system is less than 100% effective. Ventilation effectiveness will be less than 100% unless complete mixing occurs between the primary supply air and the room ambient air (i.e. short-circuiting to the return air and/or the exhaust air system). Conventional diffusers typically fall short of complete mixing; an "E_V" can be as low as 60%. Properly applied thermal core diffusers will always provide complete mixing and an "E_V" factor of one. Systems employing CO_2 sensors to control outdoor air introduction rates will use less outdoor air with thermal core diffusers than with conventional types. Example Application

Corrected Outdoor Air Volume

Appendix F of the **ASHRAE Standard 62-1989** develops the following equation to determine a correction for outdoor air volume, based on ventilation effectiveness.

Corrected outdoor air volume VO_c is determined equation: $$VO_C = \frac{VO}{E_V}$$

Where

VO = outdoor air volume

E_V = ventilation effectiveness

Ventilation effectiveness is determined by the equation: $$E_v = \frac{1 - S}{1 - R * S}$$

Where

S = Percent of non-mixed air

R = Recirculating factor (Ratio of *recirculating air volume* to *Supply air volume*)

Example

As an example, consider a classroom occupied by a teacher and 29 students (30 people). Assume a requirement of outdoor air at a rate of 15 CFM/person (450 CFM total), a supply-air volume of 714 CFM, and a supply-air temperature of 40 °F DB. The recirculation factor R is 0.37 [(714 CFM - 450 CFM)/714 CFM = 0.37]. The following table gives the calculated E_V and VO_c for ADPI values of 100%, 90%, 80%, and 70%.

Room Condition	ADPI	S	E_v	VO_c
1	100%	0	1.0	450 CFM
2	90%	0.10	0.93	484 CFM
3	80%	0.20	0.86	523 CFM
4	70%	0.30	0.79	570 CFM

Conclusions

Condition 1 - air mixing of 100% (i.e. **Thermal Core**© high induction diffuser) requires 450 CFM of outdoor air to satisfy ASHRAE 62-1989 indoor air quality standard.

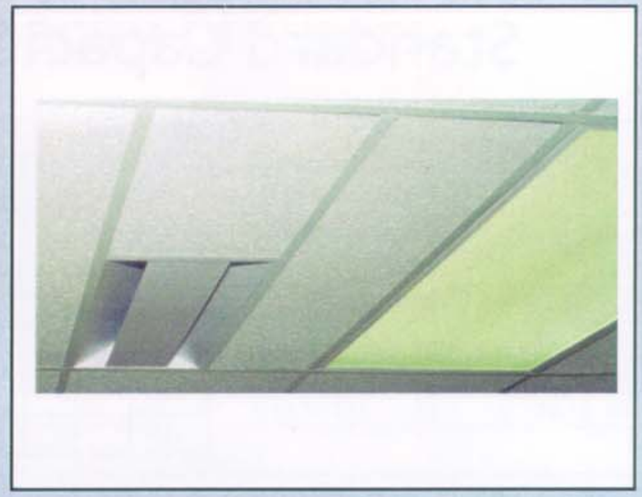
Condition 2 - air mixing of 90% (a very good conventional diffuser) requires 484 CFM - an increase of 8%.

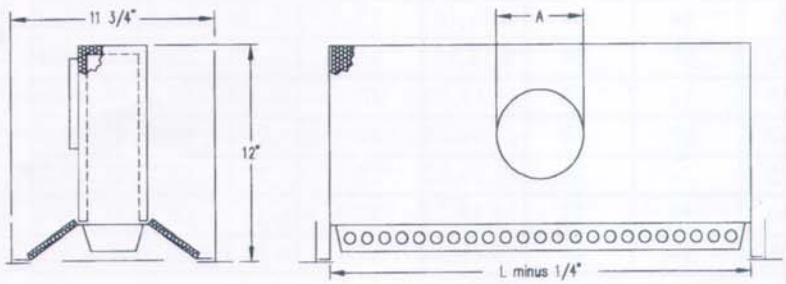
Condition 3 - air mixing of 80% (a good conventional diffuser) requires 523 CFM - an increase of 16%.

Condition 4 - air mixing of 70% (an average conventional diffuser) requires 570 CFM - an increase of 27%.

The RILT is a high induction linear diffuser designed for low temperature applications.

- Factory sealed, integral plenum with internally lined insulation protects against condensation.
- Discharge angle of leaving air designed to maintain a tight horizontal pattern even with varying air volumes.
- Face of diffuser is flush with ceiling tiles providing a smooth appearance to blend into ceiling system.
- Diffuser available in 2 and 4 ft. lengths.
- 1 or 2 way opposite blow.





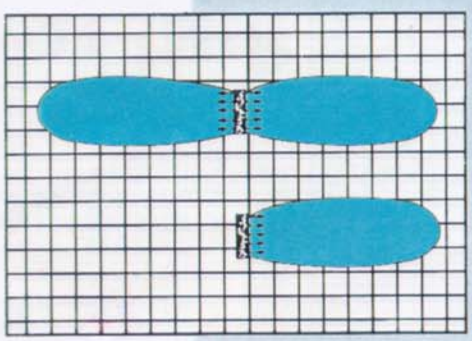
End View

Available Lengths L	Inlet Sizes
24	6,8,10
48	6,8,10

Available Inlet Sizes	A
6 Round	6 1/4
8 Round	9 3/8
10 Round	12 1/2

Air Discharge Pattern

The RILT series of low temperature diffusers are available with one-way or two-way opposite high induction jets. The number, spacing, and center of discharge openings in Thermal Core were engineered and tested to maximize the diffusers performance in VAV applications.



Air Discharge Pattern
The RILT series of cold air diffusers are available with one-way or two-way opposite high induction jets. The number, spacing, and center of discharge openings in Thermal Core were engineered and tested to maximize the diffuser's performance in VAV applications.

Thermal Core High Induction Linear Throw Standard Capacity Diffusers

RILT Standard Capacity 24" 1-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
50	.07	.07	9,12,17	16:1	<20	.041	6" RND
75	.17	.18	12,14,21	24:1	25	.041	6" RND
100	.30	.32	14,17,23	33:1	33	.041	6" RND
115	.43	.43	15,18,24	37:1	35	.041	6" RND

RILT Standard Capacity 24" 2-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
50	.01	.01	6,9,12	8:1	< 20	.082	6" RND
75	.04	.04	8.11,14	12:1	< 20	.082	6" RND
100	.07	.09	9,12,17	16:1	< 20	.082	6" RND
125	.12	.15	11,13,20	20:1	< 20	.082	6" RND
150	.17	.18	12,14,21	24:1	25	.082	8" RND
175	.24	.26	13,16,22	28:1	29	.082	8" RND
200	.30	.32	14,17,23	33:1	33	.082	8" RND
225	.39	.41	15,18,24	37:1	35	.082	8" RND

RILT Standard Capacity 48" 1-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
50	.01	.01	6,9,12	8:1	< 20	.082	6" RND
100	.07	.09	9,12,17	16:1	< 20	.082	6" RND
150	.17	.18	12,14,21	24:1	25	.082	8" RND
200	.30	.32	14,17,23	33:1	33	.082	8" RND
230	.41	.44	15,18,24	37:1	35	.082	8" RND

RILT Standard Capacity 48" 2-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
100	.01	.01	6,9,12	8:1	< 20	.164	6" RND
150	.04	.05	8,11,14	12:1	< 20	.164	6" RND
200	.07	.09	9,12,17	16:1	< 20	.164	6" RND
250	.12	.15	11,13,20	20:1	< 20	.164	6" RND
300	.17	.19	12,14,21	24:1	25	.164	8" RND
350	.24	.27	13,16,22	28:1	29	.164	8" RND
400	.30	.33	14,17,23	33:1	33	.164	8" RND
450	.39	.43	15,18,24	37:1	35	.164	8" RND

Notes:

1. Throw data is given as the distance in feet to terminal velocities of 150, 100, and 50 FPM
2. Induction ratio is the ratio of primary air to total air movement at 150 FPM
3. NC criteria represents the noise criteria which will not be exceeded by the sound pressure in any of the octave bands, 2nd through 7th, with room absorption of 10 DB.
4. AK represents the effective mean area of each diffuser.

Thermal Core High Induction Linear Throw High Capacity Diffusers

RILT High Capacity 24" 1-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
25	.01	.07	5,8,11	6:1	< 20	.0525	6" RND
50	.04	.04	9,12,17	12:1	< 20	.0525	6" RND
75	.10	.11	12,15,20	18:1	< 20	.0525	6" RND
100	.18	.20	14,16,23	24:1	23	.0525	6" RND
125	.29	.32	16,18,27	30:1	32	.0525	6" RND
150	.40	.41	18,20,32	36:1	35	.0525	6" RND

RILT High Capacity 24" 2-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
50	.01	.01	5,8,11	6:1	< 20	.105	6" RND
75	.03	.04	7.10,13	9:1	< 20	.105	6" RND
100	.04	.06	9,12,16	12:1	< 20	.105	6" RND
125	.07	.10	10,14,16	15:1	< 20	.105	6" RND
150	.10	.11	12,15,20	18:1	< 20	.105	8" RND
175	.14	.16	13,16,21	21:1	21	.105	8" RND
200	.18	.20	14,16,23	24:1	23	.105	8" RND
225	.22	.25	15,17,26	28:1	28	.105	8" RND
250	.29	.32	16,18,27	30:1	32	.105	8" RND
275	.34	.36	17,19,30	33:1	33	.105	10 OVL
300	.40	.42	18,20,32	36:1	35	.105	10 OVL

RILT High Capacity 48" 1-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
50	.01	.03	6,7,10	6:1	< 20	.1116	6" RND
100	.03	.05	11,10,13	11:1	< 20	.1116	6" RND
150	.08	.10	10,14,16	17:1	< 20	.1116	8" RND
200	.14	.07	13,16,21	23:1	21	.1116	8" RND
250	.23	.26	15,17,26	28:1	28	.1116	10"OVL
300	.31	.35	17,19,30	34:1	33	.1116	10"OVL
325	.37	.41	18,20,32	37:1	35	.1116	10"OVL

RILT High Capacity 48" 2-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
100	.01	.03	4,7,10	6:1	< 20	.2231	6" RND
150	.03	.04	5,8,11	8:1	< 20	.2231	8" RND
200	.03	.05	7.10,13	11:1	< 20	.2231	8" RND
250	.06	.09	9,12,16	14:1	< 20	.2231	8" RND
300	.08	.10	10,14,16	17:1	< 20	.2231	10 OVL
350	.11	.14	12,15,20	20:1	< 20	.2231	10 OVL
400	.14	.17	13,16,21	23:1	21	.2231	10 OVL
450	.17	.19	14,16,23	26:1	23	.2231	12 OVL
500	.23	.26	15,17,26	28:1	28	.2231	12 OVL
550	.27	.30	16,18,27	31:1	32	.2231	12 OVL
600	.31	.35	17,19,30	34:1	33	.2231	12 OVL
650	.37	.41	18,20,32	37:1	35	.2231	12 OVL

Notes:

1. Throw data is given as the distance in feet to terminal velocities of 150, 100, and 50 FPM
2. Induction ratio is the ratio of primary air to total air movement at 150 FPM
3. NC criteria represents the noise criteria which will not be exceeded by the sound pressure in any of the octave bands, 2nd through 7th, with room absorption of 10 DB.
4. AK represents the effective mean area of each diffuser.

General Specifications for Thermal Core RILT Diffusers

A. General: Air diffusers shall be of the sizes shown on the drawings. Units shall have factory catalog performance ratings which conform to CFM, temperature and velocity profiles, static pressure drop, and generated noise criteria designated. The diffusers shall be high induction type specifically designed for air distribution at temperatures down to 35 degrees Fahrenheit without dumping or forming condensation on the diffuser's surfaces and provide Air Distribution Performance Index above 95 at primary supply air volumes down to .10 CFM/ft.

B. Construction: The diffusers shall be constructed of a fire retardant material and shall be able to pass the UL 25/50 Flame Spread and Smoke Spread Test. Plenums shall be factory constructed with inlet collars sized as scheduled. Internal surfaces shall be thermally and acoustically insulated with glass fiber material, and interior surface covered with FSK foil Scrim-Kraft to prevent erosion. The plenum shall be completely sealed to provide a vapor barrier and avoid air leakage. Plenums shall be insulated to provide an overall R 4.5 value at 40 degrees Fahrenheit.

C. Ceiling Compatibility: Provide diffusers with border styles that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.

D. Performance Rating: Performance of the air diffusers shall be based on independent laboratory tests of factory built plenum/diffuser assemblies run in accordance with ADC** Standard 1062R4.

The diffusers shall be capable of supplying 35 degree Fahrenheit air directly into a room without any tendency for the supply air envelope to drop, "dump", or fall into the room. This shall be accomplished throughout its entire operating range from complete shutoff to one hundred percent flow.

The diffusers shall be capable of providing an "ADPI" of 95 or above in any room, when selected and located in accordance with the standard Thermal Core procedure. The diffusers shall be capable of providing secondary room air motion and temperature profile from the floor to the seven foot high level evenly maintained at any point in the conditioned area, and confirmed in an ADC* certified, independent laboratory test room as follows:

Test Parameters:	
Test Room Dimensions	**20' W x 24' L x 9' H**
Test Room Area	**480 sq. ft.**
Test Room Volume	**4320 cu. ft.**
Supply Air Temperature	**40 °F**
Supply Air Volume 1	**135 CFM**
CFM/ft	**.28**
Minimum Uniform Room Secondary Air Motion	**25 FPM**
Air Distribution Performance Index	**100**
Temperature Profile Variance	**± 1.5 °F**
Supply Air Volume 2	**60 CFM**
CFM/ft	**.12**
Minimum Uniform Room Secondary Air Motion	**18 FPM**
Air Distribution Performance Index	**93**
Temperature Profile Variance	**± 1.5 °F**

E. The diffusers shall be capable of supplying 35 °F air directly into a room without condensation forming on its surfaces.

Test Parameters:

Test Room as Described Above	**Air Performance Test**	**Condensation Test**
Supply Air Temperature	**40 °F**	**35 °F**
Room Air Temperature	**75 °F**	**85 °F**
Room Relative Humidity	**40 %**	**85%**

F. Types: Provide ceiling diffusers of type, capacity, performance and with accessories and finishes as listed on Air Distribution Schedule.

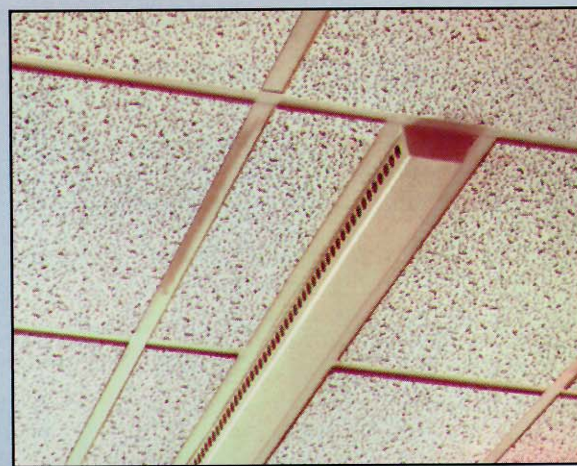
Request for substitution of the specified diffusers shall be accompanied by independent ADC certified laboratory test data documenting that the performance in this specification will be complied with. Calculations, either computerized or manual, shall be submitted for each conditioned room assuring that the minimum ADPI** listed in the schedule will be achieved by the substitute diffusers.

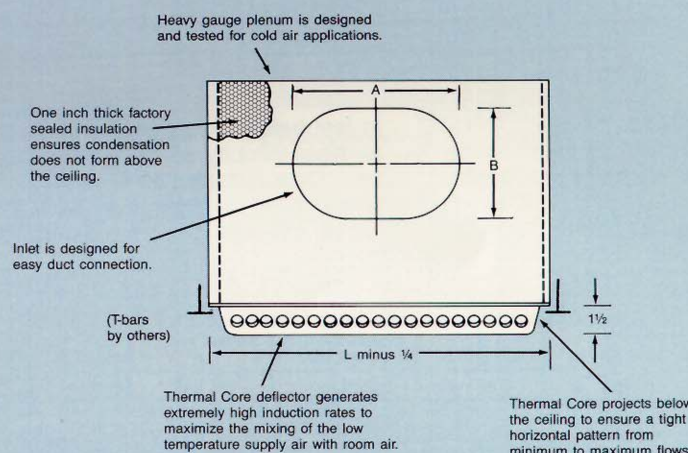
* Air Diffusion Council

** "ADPI" as described in the 1989 ASHRAE Fundamentals Handbook, Chapter 31

The HILT is a high induction linear diffuser designed for low temperature applications.

- ♦ Factory sealed, integral plenum with internally lined insulation protects against condensation.
- ♦ Discharge angle of leaving air designed to maintain a tight horizontal pattern even with varying air volumes.
- ♦ Molded face of diffuser has smooth curved appearance to blend into ceiling system.
- ♦ Diffuser available in 2 and 4 ft. lengths.
- ♦ 1 or 2 way opposite blow.



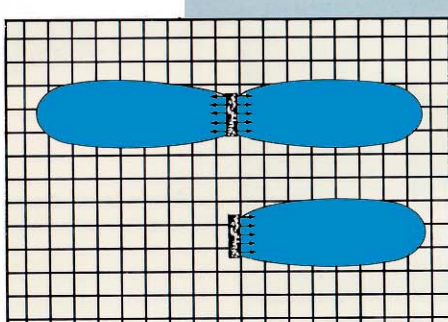


Available lengths	Available inlets
24	6, 8, 10
48	6, 8, 10

Dimensions are in inches.

Air Discharge Pattern

The HILT series of low temperature diffusers are available with one-way or two-way opposite high induction jets. The number, spacing, and center of discharge openings in Thermal Core were engineered and tested to maximize the diffusers performance in VAV applications.



Air Discharge Pattern

The HI-LT series of cold air diffusers are available with one-way or two-way opposite high induction jets. The number, spacing, and center of discharge openings in Thermal Core were engineered and tested to maximize the diffuser's performance in VAV applications.

Thermal Core High Induction Linear Throw Standard Capacity Diffusers

HILT Standard Capacity 24” 1-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
50	.07	.07	9,12,17	16:1	<20	.041	6" RND
75	.17	.18	12,14,21	24:1	25	.041	6" RND
100	.30	.32	14,17,23	33:1	33	.041	6" RND
115	.43	.43	15,18,24	37:1	35	.041	6" RND

HILT Standard Capacity 24” 2-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
50	.01	.01	6,9,12	8:1	< 20	.082	6" RND
75	.04	.04	8.11,14	12:1	< 20	.082	6" RND
100	.07	.09	9,12,17	16:1	< 20	.082	6" RND
125	.12	.15	11,13,20	20:1	< 20	.082	6" RND
150	.17	.18	12,14,21	24:1	25	.082	8" RND
175	.24	.26	13,16,22	28:1	29	.082	8" RND
200	.30	.32	14,17,23	33:1	33	.082	8" RND
225	.39	.41	15,18,24	37:1	35	.082	8" RND

HILT Standard Capacity 48” 1-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
50	.01	.01	6,9,12	8:1	< 20	.082	6" RND
100	.07	.09	9,12,17	16:1	< 20	.082	6" RND
150	.17	.18	12,14,21	24:1	25	.082	8" RND
200	.30	.32	14,17,23	33:1	33	.082	8" RND
230	.41	.44	15,18,24	37:1	35	.082	8" RND

HILT Standard Capacity 48” 2-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
100	.01	.01	6,9,12	8:1	< 20	.164	6" RND
150	.04	.05	8,11,14	12:1	< 20	.164	6" RND
200	.07	.09	9,12,17	16:1	< 20	.164	6" RND
250	.12	.15	11,13,20	20:1	< 20	.164	6" RND
300	.17	.19	12,14,21	24:1	25	.164	8" RND
350	.24	.27	13,16,22	28:1	29	.164	8" RND
400	.30	.33	14,17,23	33:1	33	.164	8" RND
450	.39	.43	15,18,24	37:1	35	.164	8" RND

Notes:

1. Throw data is given as the distance in feet to terminal velocities of 150, 100, and 50 FPM
2. Induction ratio is the ratio of primary air to total air movement at 150 FPM
3. NC criteria represents the noise criteria which will not be exceeded by the sound pressure in any of the octave bands, 2nd through 7th, with room absorption of 10 DB.
4. AK represents the effective mean area of each diffuser.

Thermal Core High Induction Linear Throw High Capacity Diffusers

HILT High Capacity 24” 1-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw[1]	Induction[2] Ratio @150 FPM[1]	NC[3]	AK[4]	Inlet Size Inches
25	.01	.07	5,8,11	6:1	< 20	.0525	6" RND
50	.04	.04	9,12,17	12:1	< 20	.0525	6" RND
75	.10	.11	12,15,20	18:1	< 20	.0525	6" RND
100	.18	.20	14,16,23	24:1	23	.0525	6" RND
125	.29	.32	16,18,27	30:1	32	.0525	6" RND
150	.40	.41	18,20,32	36:1	35	.0525	6" RND

HILT High Capacity 24” 2-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw [1]	Induction [2] Ratio @150 FPM [1]	NC [3]	AK [4]	Inlet Size Inches
50	.01	.01	5,8,11	6:1	< 20	.105	6" RND
75	.03	.04	7.10,13	9:1	< 20	.105	6" RND
100	.04	.06	9,12,16	12:1	< 20	.105	6" RND
125	.07	.10	10,14,16	15:1	< 20	.105	6" RND
150	.10	.11	12,15,20	18:1	< 20	.105	8" RND
175	.14	.16	13,16,21	21:1	21	.105	8" RND
200	.18	.20	14,16,23	24:1	23	.105	8" RND
225	.22	.25	15,17,26	28:1	28	.105	8" RND
250	.29	.32	16,18,27	30:1	32	.105	8" RND
275	.34	.36	17,19,30	33:1	33	.105	10 OVL
300	.40	.42	18,20,32	36:1	35	.105	10 OVL

HILT High Capacity 48” 1-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw [1]	Induction [2] Ratio @150 FPM [1]	NC [3]	AK [4]	Inlet Size Inches
50	.01	.03	4,7,10	6:1	< 20	.1116	6" RND
100	.03	.05	7,10,13	11:1	< 20	.1116	6" RND
150	.08	.10	10,14,16	17:1	< 20	.1116	8" RND
200	.14	.07	13,16,21	23:1	21	.1116	8" RND
250	.23	.26	15,17,26	28:1	28	.1116	10"OVL
300	.31	.35	17,19,30	34:1	33	.1116	10"OVL
325	.37	.41	18,20,32	37:1	35	.1116	10"OVL

HILT High Capacity 48” 2-Way Blow

Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw [1]	Induction [2] Ratio @150 FPM [1]	NC [3]	AK [4]	Inlet Size Inches
100	.01	.03	4,7,10	6:1	< 20	.2231	6" RND
150	.03	.04	5,8,11	8:1	< 20	.2231	8" RND
200	.03	.05	7.10,13	11:1	< 20	.2231	8" RND
250	.06	.09	9,12,16	14:1	< 20	.2231	8" RND
300	.08	.10	10,14,16	17:1	< 20	.2231	10 OVL
350	.11	.14	12,15,20	20:1	< 20	.2231	10 OVL
400	.14	.17	13,16,21	23:1	21	.2231	10 OVL
450	.17	.19	14,16,23	26:1	23	.2231	12 OVL
500	.23	.26	15,17,26	28:1	28	.2231	12 OVL
550	.27	.30	16,18,27	31:1	32	.2231	12 OVL
600	.31	.35	17,19,30	34:1	33	.2231	12 OVL
650	.37	.41	18,20,32	37:1	35	.2231	12 OVL

Notes:
1. Throw data is given as the distance in feet to terminal velocities of 150, 100, and 50 FPM
2. Induction ratio is the ratio of primary air to total air movement at 150 FPM
3. NC criteria represents the noise criteria which will not be exceeded by the sound pressure in any of the octave bands, 2nd through 7th, with room absorption of 10 DB.
4. AK represents the effective mean area of each diffuser.

General Specifications for Thermal Core HILT Diffusers

A. General: Air diffusers shall be of the sizes shown on the drawings. Units shall have factory catalog performance ratings which conform to CFM, temperature and velocity profiles, static pressure drop, and generated noise criteria designated. The diffusers shall be high induction type specifically designed for air distribution at temperatures down to 35 degrees Fahrenheit without dumping or forming condensation on the diffuser's surfaces and provide Air Distribution Performance Index above 95 at primary supply air volumes down to .10 CFM/ft.

B. Construction: The diffusers shall be constructed of a fire retardant material and shall be able to pass the UL 25/50 Flame Spread and Smoke Spread Test. Plenums shall be factory constructed with inlet collars sized as scheduled. Internal surfaces shall be thermally and acoustically insulated with glass fiber material, and interior surface covered with FSK foil Scrim-Kraft to prevent erosion. The plenum shall be completely sealed to provide a vapor barrier and avoid air leakage. Plenums shall be insulated to provide an overall R 4.5 value at 40 degrees Fahrenheit.

C. Ceiling Compatibility: Provide diffusers with border styles that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.

D. Performance Rating: Performance of the air diffusers shall be based on independent laboratory tests of factory built plenum/diffuser assemblies run in accordance with ADC** Standard 1062R4.

The diffusers shall be capable of supplying 35 degree Fahrenheit air directly into a room without any tendency for the supply air envelope to drop, "dump", or fall into the room. This shall be accomplished throughout its entire operating range from complete shutoff to one hundred percent flow.

The diffusers shall be capable of providing an "ADPl" of 95 or above in any room, when selected and located in accordance with the standard Thermal Core procedure. The diffusers shall be capable of providing secondary room air motion and temperature profile from the floor to the seven foot high level evenly maintained at any point in the conditioned area, and confirmed in an ADC* certified, independent laboratory test room as follows:

Test Parameters:

Test Room Dimensions	**20' W x 24' L x 9' H**
Test Room Area	**480 sq. ft.**
Test Room Volume	**4320 cu. ft.**
Supply Air Temperature	**40 °F**
Supply Air Volume 1	**135 CFM**
CFM/ft	**.28**
Minimum Uniform Room Secondary Air Motion	**25 FPM**
Air Distribution Performance Index	**100**
Temperature Profile Variance	**± 1.5 °F**
Supply Air Volume 2	**60 CFM**
CFM/ft	**.12**
Minimum Uniform Room Secondary Air Motion	**18 FPM**
Air Distribution Performance Index	**93**
Temperature Profile Variance	**± 1.5 °F**

E. The diffusers shall be capable of supplying 35 °F air directly into a room without condensation forming on its surfaces.

Test Parameters:

Test Room as Described Above	Air Performance Test	Condensation Test
Supply Air Temperature	40 °F	35 °F
Room Air Temperature	75 °F	85 °F
Room Relative Humidity	40 %	85%

F. Types: Provide ceiling diffusers of type, capacity, performance and with accessories and finishes as listed on Air Distribution Schedule.

Request for substitution of the specified diffusers shall be accompanied by independent ADC certified laboratory test data documenting that the performance in this specification will be complied with. Calculations, either computerized or manual, shall be submitted for each conditioned room assuring that the minimum ADPI** listed in the schedule will be achieved by the substitute diffusers.

* Air Diffusion Council
** "ADPI" as described in the 1989 ASHRAE Fundamentals Handbook, Chapter 31

Model OMNI-LT High Induction

Thermal Core Cold Air Diffuser

Model OMNI-LT

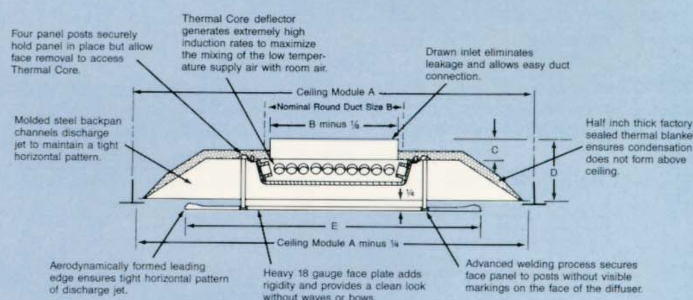
High Induction

U.S. Patent No. 4,876,949
Canadian patent No. 613,716

The OMNI-LT is designed for low temperature applications. This diffuser combines a strong unobtrusive appearance with exceptional performance.

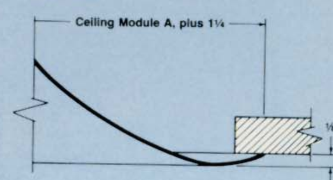
- The patented Thermal Core generates a high velocity jet that maximizes induction of room air.
- The curved, molded shape of the backpan combines with the airfoil discharge edge of the face panel to provide a tight horizontal pattern.
- The face panel is constructed from 18 gauge steel. The formed edges of the face assures a straight and level surface.
- The backpan is factory sealed with 1/2" thick insulation with a vapor barrier which protects against moisture forming in unconditioned plenum space.
- The face panel is held in place by steel rods that lock into backpan. The panel can be removed from the backpan.
- Material is heavy guage steel (18 guage in the face panel).

☐ **Border Type 3 (Lay-in) Full Face**

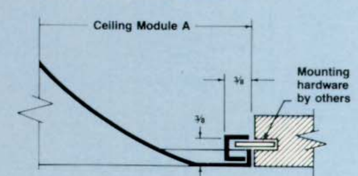


Ceiling Module A	Nominal Round Duct size B	C	D	E
24 x 24	6, 8	1 1/4	3 3/4	18
	10	1 3/8	3 7/8	18
12 x 12	6	1 1/4	3 3/4	9

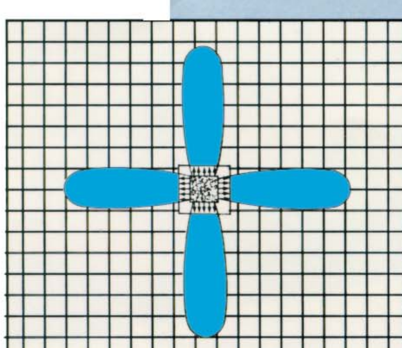
☐ **Frame Type 1 (Surface Mount) Full Face**



☐ **Frame Type 4 (Spline) Full Face or Panel Mounted**



Dimensions are in inches.



Air Discharge Pattern

The OMNI-LT generates a four-way star pattern high induction jet. The diffuser was engineered to form the star pattern in order to maximize performance in VAV applications.

Thermal Core OMNI-LT High Induction Diffusers

	Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw [1]	Blow Pattern	Induction [2] Ratio @150 FPM [1]	NC [3]	AK [4]	Inlet Size Inches
*	50	.06	.06	5,7,11	2-Way	15:1	< 20	.046	6" RND
*	75	.17	.18	7,8,12	2-Way	22:1	23	.046	6" RND
*	100	.29	.31	8,11,15	2-Way	29:1	33	.046	6" RND
	125	.11	.12	6,8,12	4-Way	18:1	< 20	.092	8" RND
	150	.17	.18	7,8,12	4-Way	22:1	23	.092	8" RND
	175	.22	.24	8,9,14	4-Way	25:1	28	.092	8" RND
	200	.29	.31	8,11,15	4-Way	29:1	33	.092	8" RND
	225	.22	.23	9,10,14	4-Way	33:1	32	.092	10 RND
	250	.28	.29	9,11,15	4-Way	36:1	35	.092	10 RND

* Available in 12” x 12”, in 4-way blow only.

Notes:

1. Throw data is given as the distance in feet to terminal velocities of 150, 100, and 50 FPM
2. Induction ratio is the ratio of primary air to total air movement at 150 FPM
3. NC criteria represents the noise criteria which will not be exceeded by the sound pressure in any of the octave bands, 2nd through 7th, with room absorption of 10 DB.
4. AK represents the effective mean area of each diffuser.

Thermal Core
Cold Air
Perforated Diffuser

Model PSS-LT

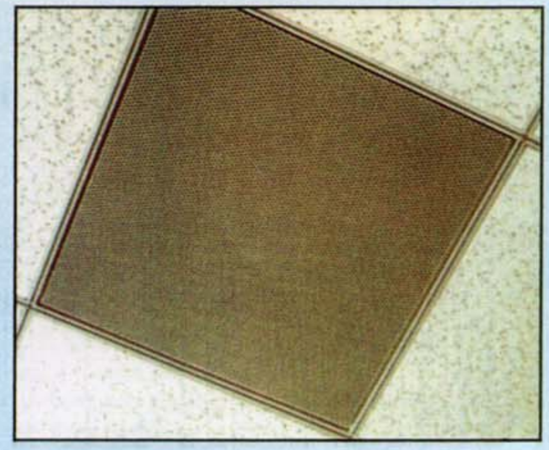
High Induction

U.S. Patent No. 4,876,949
Canadian patent No. 613,716

The PSS-LT is designed for cold air applications. The patented Thermal Core generates a high velocity jet that maximizes the room induction rate.

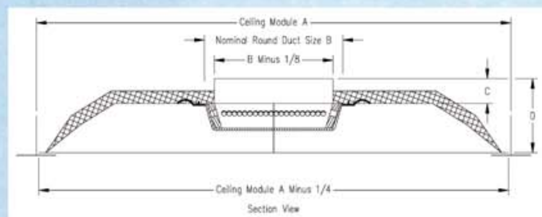
- Factory sealed plenum with internally lined insulation.
- Condensation guard on back pan protects against moisture forming in unconditioned plenum space.
- Backpan design to provide tight horizontal discharge pattern even in VAV applications.
- Four-way discharge pattern optimizes induction rate and throw to maintain maximum comfort in occupied zone.
- Face is removable allowing access to Thermal Core.
- Perforated face has 3/16" diameter holes on 1/4" staggered centers.
- Inlet collar (neck) has ample depth for easy duct connection.
- Material: Heavy gauge steel backpan molded Thermal Core, steel perforated face.

Standard Finish:
#26 white



☐ **Border Type 3 (Lay-in) Full Face**

½" thick factory sealed thermal blanket, with vapor barrier, ensures condensation does not form above ceiling.

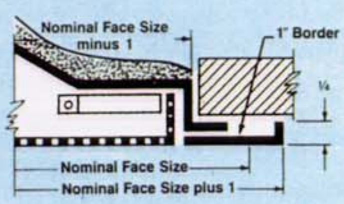


Internal baffling and molded backpan keeps discharge air tight against the ceiling.

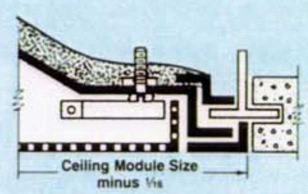
Thermal Core's deflector generates extremely high induction rates to maximize the mixing of the low temperature air supply with room air.

Ceiling Module A	Nominal Round Duct size B	C	D
24 x 24	6, 8	1 1/4	3 3/4
	10	1 3/8	3 7/8
12 x 12	6	1 1/4	3 3/4

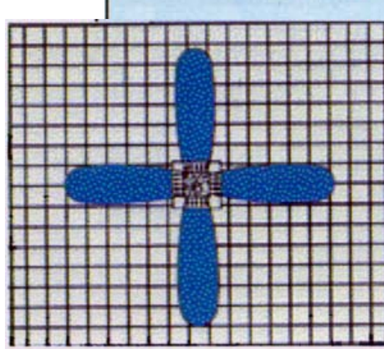
☐ **Border Type 1 (Surface Mount)**



☐ **Border Type 4 (Spline Side Lock)**



Dimensions are in inches.



Air Discharge Pattern

The PSS-LT generates a two-way opposite, high induction jet. The diffuser was engineered to form this pattern in order to maximize the diffuser's performance in VAV applications.

Thermal Core High Induction PSS-LT Diffusers

	Air Flow CFM	Static Pressure Inch WC	Total Pressure Inch WC	Throw [1]	Blow Pattern	Induction [2] Ratio @150 FPM [1]	NC [3]	AK [4]	Inlet Size Inches
*	50	.06	.06	3,5,7	2-Way	15:1	< 20	.046	6" RND
*	75	.17	.18	4,6,8	2-Way	22:1	23	.046	6" RND
*	100	.29	.31	3,5,7	2-Way	29:1	33	.046	6" RND
	125	.11	.12	3,5,7	4-Way	18:1	< 20	.092	8" RND
	150	.17	.18	4,6,8	4-Way	22:1	23	.092	8" RND
	175	.22	.24	5,6,9	4-Way	25:1	28	.092	8" RND
	200	.29	.31	6,7,10	4-Way	29:1	33	.092	8" RND
	225	.22	.23	6,8,11	4-Way	33:1	32	.092	10 RND
	250	.28	.29	7,8,11	4-Way	36:1	35	.092	10 RND

* Available in 12" x 12", in 4-way blow only.

Notes:

1. Throw data is given as the distance in feet to terminal velocities of 150, 100, and 50 FPM
2. Induction ratio is the ratio of primary air to total air movement at 150 FPM
3. NC criteria represents the noise criteria which will not be exceeded by the sound pressure in any of the octave bands, 2nd through 7th, with room absorption of 10 DB.
4. AK represents the effective mean area of each diffuser.

Public television station control room.

General Specifications for Thermal Core OMNI-LT Diffusers

A. General: Air diffusers shall be of the sizes shown on the drawings. Units shall have factory catalog performance ratings which conform to CFM, temperature and velocity profiles, static pressure drop, and generated noise criteria designated. The diffusers shall be high induction type specifically designed for air distribution at temperatures down to 35 degrees Fahrenheit without dumping or forming condensation on the diffuser's surfaces and provide Air Distribution Performance Index above 95 at primary supply air volumes down to .10 CFM/ft.

B. Construction: The diffusers shall be constructed of die-formed steel with baked enamel finish. Induction core shall be constructed of a fire retardant composite material and shall be able to pass the UL 25/50 Flame Spread and Smoke Spread Test. The back-pans shall be insulated with a closed cell anti-fiber insulating material. The inlet collars shall be sized as scheduled.

C. Ceiling Compatibility: Provide diffusers with border styles that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.

D. Performance Rating: Performance of the air diffusers shall be based on independent laboratory tests of factory built plenum/diffuser assemblies run in accordance with ADC** Standard 1062R4.

The diffusers shall be capable of supplying 35 degree Fahrenheit air directly into a room without any tendency for the supply air envelope to drop, "dump", or fall into the room. This shall be accomplished throughout its entire operating range from complete shutoff to one hundred percent flow.

The diffusers shall be capable of providing an "ADPl" of 95 or above in any room, when selected and located in accordance with the standard Thermal Core procedure. The diffusers shall be capable of providing secondary room air motion and temperature profile from the floor to the seven foot high level evenly maintained at any point in the conditioned area, and confirmed in an ADC* certified, independent laboratory test room as follows:

Test Parameters:

Test Room Dimensions	**20' W x 24' L x 9' H**
Test Room Area	**480 sq. ft.**
Test Room Volume	**4320 cu. ft.**
Supply Air Temperature	**40 °F**
Supply Air Volume 1	**135 CFM**
CFM/ft	**.28**
Minimum Uniform Room Secondary Air Motion	**25 FPM**
Air Distribution Performance Index	**100**
Temperature Profile Variance	**± 1.5 °F**
Supply Air Volume 2	**60 CFM**
CFM/ft	**.12**
Minimum Uniform Room Secondary Air Motion	**18 FPM**
Air Distribution Performance Index	**93**
Temperature Profile Variance	**± 1.5 °F**

E. The diffusers shall be capable of supplying 35 °F air directly into a room without condensation forming on its surfaces.

Test Parameters:

Test Room as Described Above	**Air Performance Test**	**Condensation Test**
Supply Air Temperature	**40 °F**	**35 °F**
Room Air Temperature	**75 °F**	**85 °F**
Room Relative Humidity	**40 %**	**85%**

F. Types: Provide ceiling diffusers of type, capacity, performance and with accessories and finishes as listed on Air Distribution Schedule.

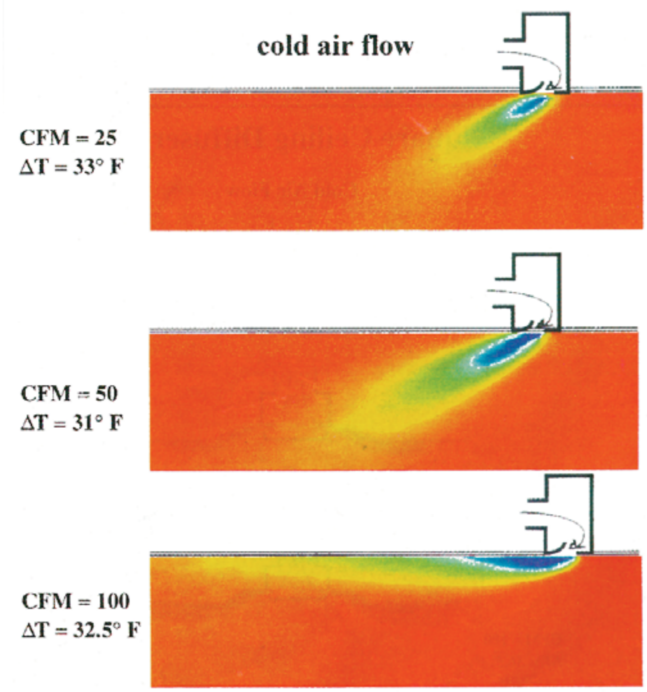
Request for substitution of the specified diffusers shall be accompanied by independent ADC certified laboratory test data documenting that the performance in this specification will be complied with. Calculations, either computerized or manual, shall be submitted for each conditioned room assuring that the minimum ADPI** listed in the schedule will be achieved by the substitute diffusers.

* Air Diffusion Council

** "ADPI" as described in the 1989 ASHRAE Fundamentals Handbook, Chapter 31

Thermal Imaging of Two Diffuser Types

Slot Diffuser



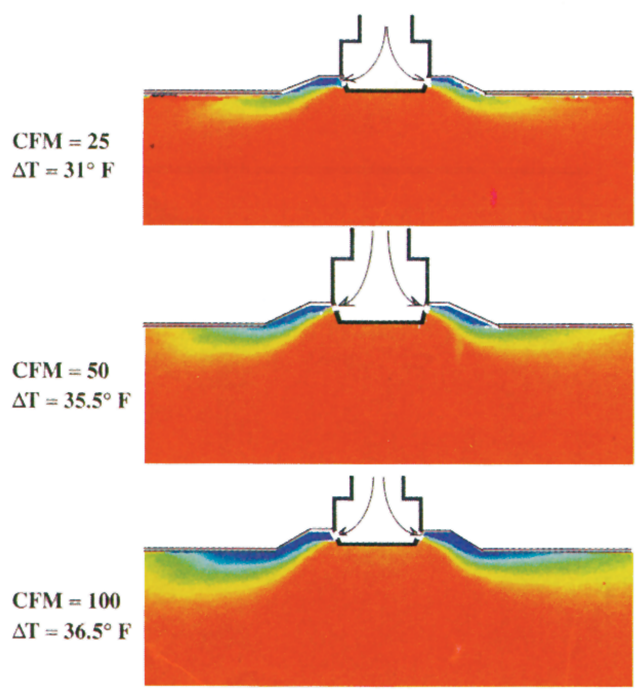
Continues to dump at 25% flow.

Begins to dump at 50% flow.

Diffuser performs at full flow.

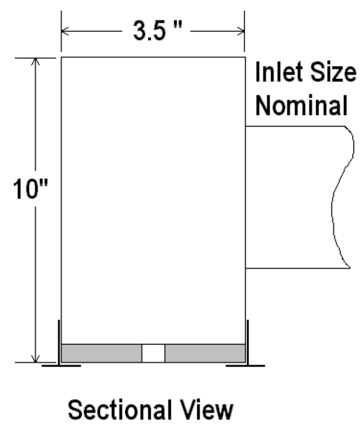
Thermal Core Omni-Diffuser

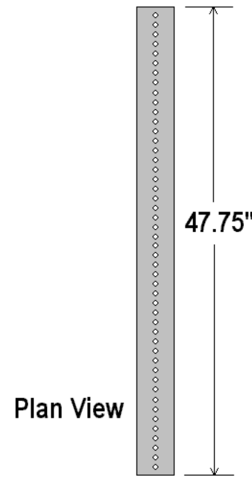
Cold Air Flow



Thermal Core Diffuser does not dump and maintains high induction down to 25% flow.

Thermal Core HCRD Downflow High Induction Diffuser

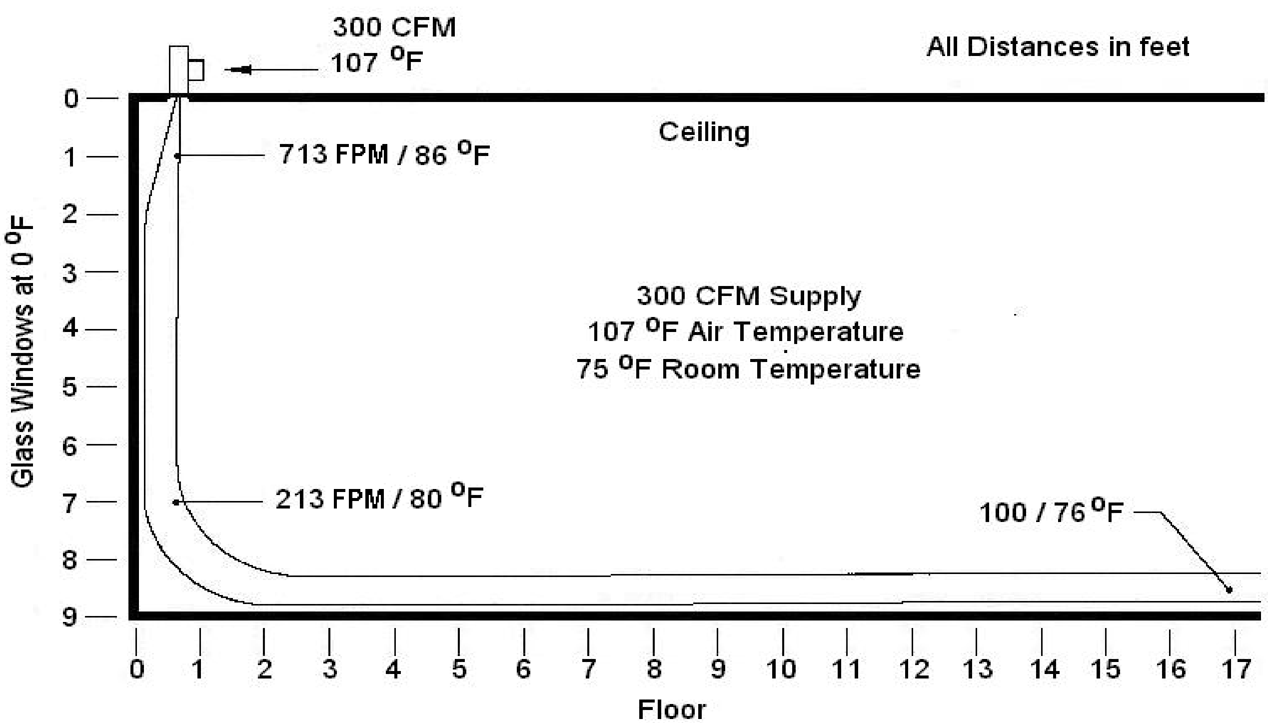




Air Flow CFM/hole	Static Pressure Inch W.C.	Throw [1]	Induction Ratio @ 150 FPM [2]	NC [3]	AK[4]
0.98	.01	4,7,10	6:1	< 20	.1116
1.96	.03	7,10,13	11:1	< 20	.1116
2.94	.08	10,14,16	17:1	< 20	.1116
3.92	.14	13,16,21	23:1	21	.1116
4.90	.23	15,17,26	28:1	28	.1116
5.88	.31	17,19,30	34:1	33	.1116
6.37	.37	18,20,32	37:1	35	.1116

Notes:

1. Throw data is given as the distance in feet to terminal velocities of 150, 100, and 50 FPM
2. Induction ratio is the ratio of primary air to total air movement at 150 FPM
3. NC criteria represents the noise criteria which will not be exceeded by the sound pressure in any of the octave bands, 2nd through 7th, with room absorption of 10 DB.
4. AK represents the effective mean area of each diffuser.



HCRD High Capacity 48" Downflow - Heating Test

General Specifications for Thermal Core HCRD Diffusers

A. General: Air diffusers shall be of the sizes shown on the drawings. Units shall have factory catalog performance ratings which conform to CFM, temperature and velocity profiles, static pressure drop, and generated noise criteria designated. The diffusers shall be high induction type specifically designed for air distribution at temperatures down to 35 °F in the cooling mode and 140 °F in the heating mode without dumping or forming condensation on the diffuser's surfaces and provide Air Distribution Performance Index above 95 at primary supply air volumes down to .10 CFM/ft.

B. Construction: The diffusers shall be constructed of a fire retardant material and shall be able to pass the UL 25/50 Flame Spread and Smoke Spread Test. Plenums shall be factory constructed with inlet collars sized as scheduled. Internal surfaces shall be thermally and acoustically insulated with glass fiber material, and interior surface covered with FSK foil Scrim-Kraft to prevent erosion. The plenum shall be completely sealed to provide a vapor barrier and avoid air leakage. Plenums shall be insulated to provide an overall R 4.5 value at 40 degrees Fahrenheit.

C. Ceiling Compatibility: Provide diffusers with border styles that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.

D. Performance Rating: Performance of the air diffusers shall be based on independent laboratory tests of factory built plenum/diffuser assemblies run in accordance with ADC** Standard 1062R4.

The diffusers shall be capable of supplying 35 degree Fahrenheit air directly into a room without any tendency for the supply air envelope to drop, "dump", or fall into the room. This shall be accomplished throughout its entire operating range from complete shutoff to one hundred percent flow.

The diffusers shall be capable of providing an "ADPl" of 95 or above in any room, when selected and located in accordance with the standard Thermal Core procedure. The diffusers shall be capable of providing secondary room air motion and temperature profile from the floor to the seven foot high level evenly maintained at any point in the conditioned area, and confirmed in an ADC* certified, independent laboratory test room as follows:

Test Parameters:

Test Room Dimensions	**20' W x 24' L x 9' H**
Test Room Area	**480 sq. ft.**
Test Room Volume	**4320 cu. ft.**
Supply Air Temperature	**40 °F**
Supply Air Volume 1	**135 CFM**
CFM/ft	**.28**
Minimum Uniform Room Secondary Air Motion	**25 FPM**
Air Distribution Performance Index	**100**
Temperature Profile Variance	**± 1.5 °F**
Supply Air Volume 2	**60 CFM**
CFM/ft	**.12**
Minimum Uniform Room Secondary Air Motion	**18 FPM**
Air Distribution Performance Index	**93**
Temperature Profile Variance	**± 1.5 °F**

E. The diffusers shall be capable of supplying 35 °F air directly into a room without condensation forming on its surfaces.

Test Parameters:

Test Room as Described Above	Air Performance Test	Condensation Test
Supply Air Temperature	40 °F	35 °F
Room Air Temperature	75 °F	85 °F
Room Relative Humidity	40 %	85%

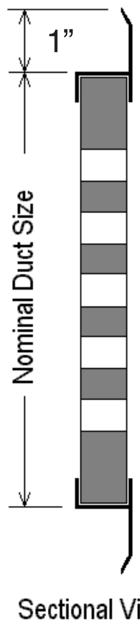
F. Types: Provide ceiling diffusers of type, capacity, performance and with accessories and finishes as listed on Air Distribution Schedule.

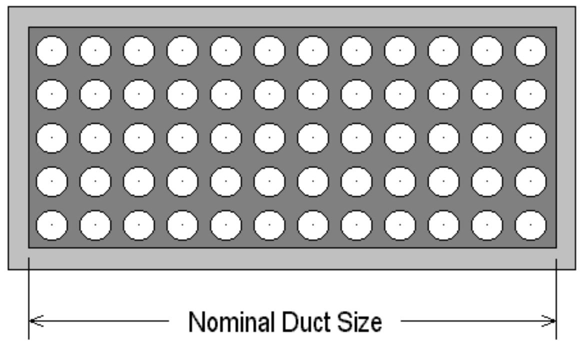
Request for substitution of the specified diffusers shall be accompanied by independent ADC certified laboratory test data documenting that the performance in this specification will be complied with. Calculations, either computerized or manual, shall be submitted for each conditioned room assuring that the minimum ADPI** listed in the schedule will be achieved by the substitute diffusers.

* Air Diffusion Council

** "ADPI" as described in the 1989 ASHRAE Fundamentals Handbook, Chapter 31

HCRH High Capacity Horizontal





Air Flow CFM/hole	Static Pressure Inch W.C.	Throw [1]	Induction Ratio @ 150 FPM [2]	NC [3]	AK[4]
0.98	.01	4,7,10	6:1	< 20	.00219
1.96	.03	7,10,13	11:1	< 20	.00219
2.94	.08	10,14,16	17:1	< 20	.00219
3.92	.14	13,16,21	23:1	21	.00219
4.90	.23	15,17,26	28:1	28	.00219
5.88	.31	17,19,30	34:1	33	.00219
6.37	.37	18,20,32	37:1	35	.00219

Notes:
1. Throw data is given as the distance in feet to terminal velocities of 150, 100, and 50 FPM.
2. Induction ratio is the ratio of primary air to total air movement at 150 FPM
3. NC criteria represents the noise criteria which will not be exceeded by the sound pressure in any of the octave bands, 2nd through 7th, with room absorption of 10 DB.
4. AK represents the effective mean area of each diffuser. To determine overall diffuser AK multiply .0022 x dry of holes.

One hole per square inch of face area - i.e. - 48” x 12” = 576 holes.
Minimum height = 4” : Maximum height = 12”
Minimum width = 12” : Maximum width = 48”
Contact factory for larger sizes.

General Specifications for Thermal Core HCRH Diffusers

A. General: Air diffusers shall be of the sizes shown on the drawings. Units Shall have factory catalog performance ratings which conform to CFM, induction ratios, temperature and velocity profiles, static pressure drop, and generated noise criteria designated. The diffusers shall be high induction type specifically designed for air distribution at temperatures down to 35 degrees Fahrenheit in the cooling mode and 140 degrees Fahrenheit in the heating mode without dumping or forming condensation on the diffuser's surfaces and provide Air Distribution Performance Index above 95 at primary supply air volumes down to .10 CFM(ft.

B. Construction: The diffusers shall be constructed of a fire retardant material and shall be able to pass the UL 25/50 Flame Spread and Smoke Spread Test..

C. Mounting Frames: Frames shall be constructed of extruded aluminum suitable for mounting in a hard-wall or directly to ducts.

D. Performance Rating: Performance of the air diffusers shall be based on independent laboratory tests of factory built diffuser assemblies run in accordance with ADC** Standard 1062R4.

The diffusers shall be capable of supplying 35 degree Fahrenheit cooling mode or 140 degrees Fahrenheit in the heating mode air directly into a room without any tendency for the supply air envelope to enter the occupied area of the room. This shall be accomplished throughout its entire operating range from complete shutoff to one hundred percent flow.

The diffusers shall be capable of providing an "ADPI" of 95 or above in any room, when selected and located in accordance with the standard thermal core procedure. The diffusers shall be capable of providing secondary room air motion and temperature profile from the floor to the seven foot high level evenly maintained at any point in the conditioned area.

E. The diffusers shall be capable of supplying 35 °F air directly into a room without condensation forming on its surfaces.

Test Parameters:

Test Room as Described Above	Air Performance Test	Condensation Test
Supply Air Temperature	40 °F	35 °F
Room Air Temperature	75 °F	85 °F
Room Relative Humidity	40 %	85%

F. Types: Provide ceiling diffusers of type, capacity, performance and with accessories and finishes as listed on Air Distribution Schedule.

Request for substitution of the specified diffusers shall be accompanied by independent ADC certified laboratory test data documenting that the performance in this specification will be complied with. Calculations, either computerized or manual, shall be submitted for each conditioned room assuring that the minimum ADPI** listed in the schedule will be achieved by the substitute diffusers.

MCI Springfield, Missouri provides high indoor air quality for its employees by choosing thermal core direct jet induction diffusers.

Andy Williams Theatre, Branson, Missouri, solves a tough heating, cooling, and humidity challenge by utilizing thermal core direct jet induction diffusers and cold air distribution. Results! Excellent occupant comfort.

Evangel College provides an excellent study environment by applying thermal core diffusing and cold air distribution to insure high indoor air quality.

St. John's Breech Medical Center, Lebanon, Missouri chooses Thermal Core diffusers and cold air distribution to insure high indoor air quality and humidity control.

The new state of the art Bone and Joint Center at Cox Hospital Springfield, Missouri applied cold air distribution and ThermalCore Diffuser to insure an ADPI of 95%. The RILT was utilized exclusively through out the entire building.

Shoji Tabuchi Theater, Branson, Missouri also utilized cold air distribution to maintain an excellent comfort level. ThermalCore diffusers were used to delivery this low temperature air directly into the theater.

College of the Ozarks used cold air distribution and used TermalCore diffusers to deliver this low temperature air in their state of the art training facility. ThermalCore diffuser blended into the unique architectural ceiling.

THERMAL CORE DIFFUSER SELECTION AND LOCATION

1) Select diffusers for 80 to 100 percent of their nominal air flow rating.

2) Deactivate nozzles if necessary.

3) Diffuser Location:

a) Air stream from opposing diffusers should not collide at greater than 150 FPM air velocity.

b) Air stream from diffusers should meet adjacent walls between 50 to 1500 FPM air velocity.

c) Diffusers should be placed so that the lateral distance between a diffuser and the wall is the diffuser's throw (in feet) at 50 FPM terminal velocity times 0.404, or less. The lateral distance between adjacent diffusers is the diffuser's throw at 50 FPM terminal velocity times 0.808, or less.

Diffuser Throw Drawings

The following sequence illustrates some of the more common errors made in air-distribution design. The first four cases show stagnation, turbulence, and over-sized diffuser selection leading to low induction ratio. Case 5 illustrates the principles behind proper placement of diffusers. All cases apply to a typical 1,110 ft^2 classroom with a total air flow of 450 cfm.

Case 1. A single HILT-48" 2-way

Induction Ratio 37:1

ADPI = <85 due to stagnant area

Case 2. Two HILT-48" 1-way

Induction Ratio 37:1
ADPI = <85 due to stagnant area

Case 3. Two HILT-24" 2-way (Perpendicular configuration)

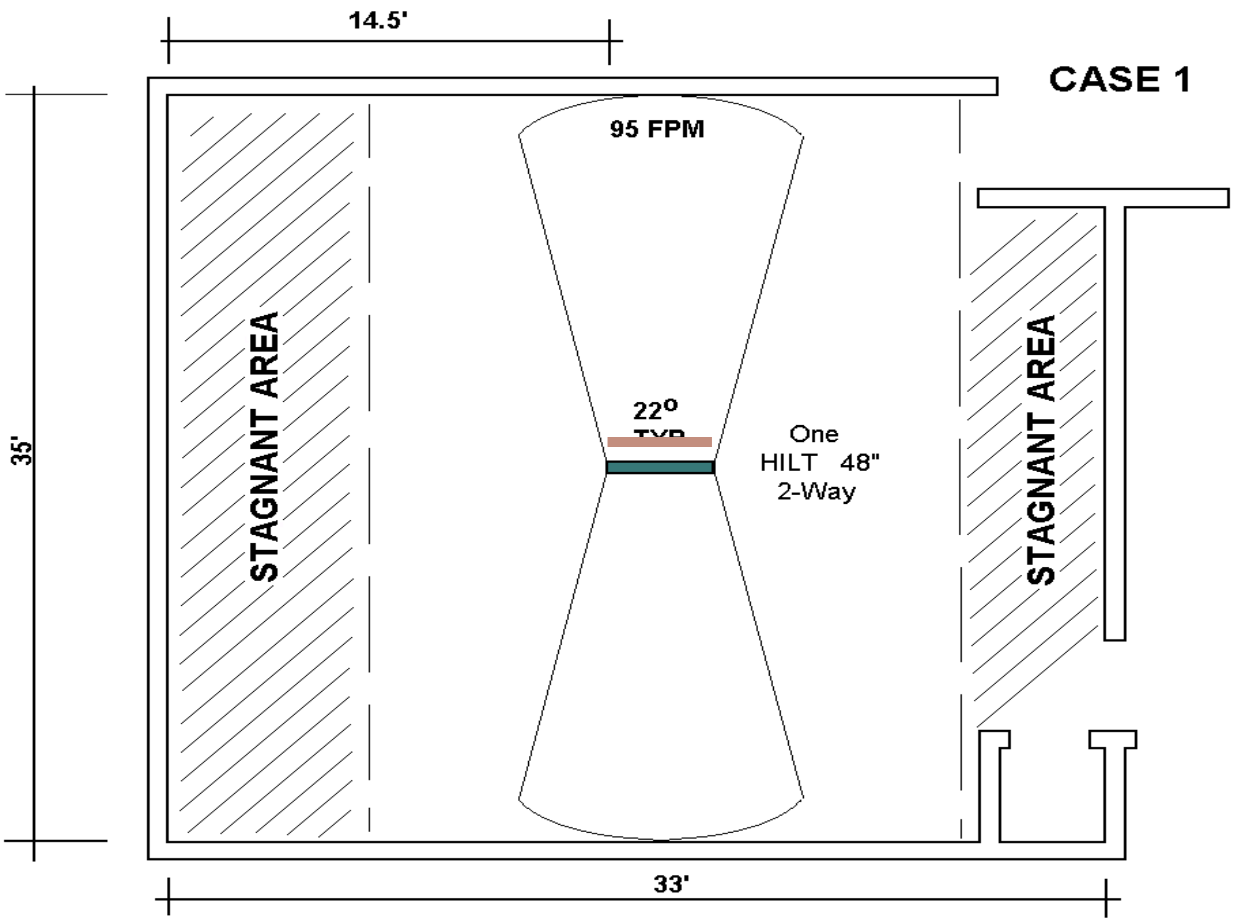
Induction Ratio 37:1
ADPI = <70 due to stagnant area and turbulent downwash

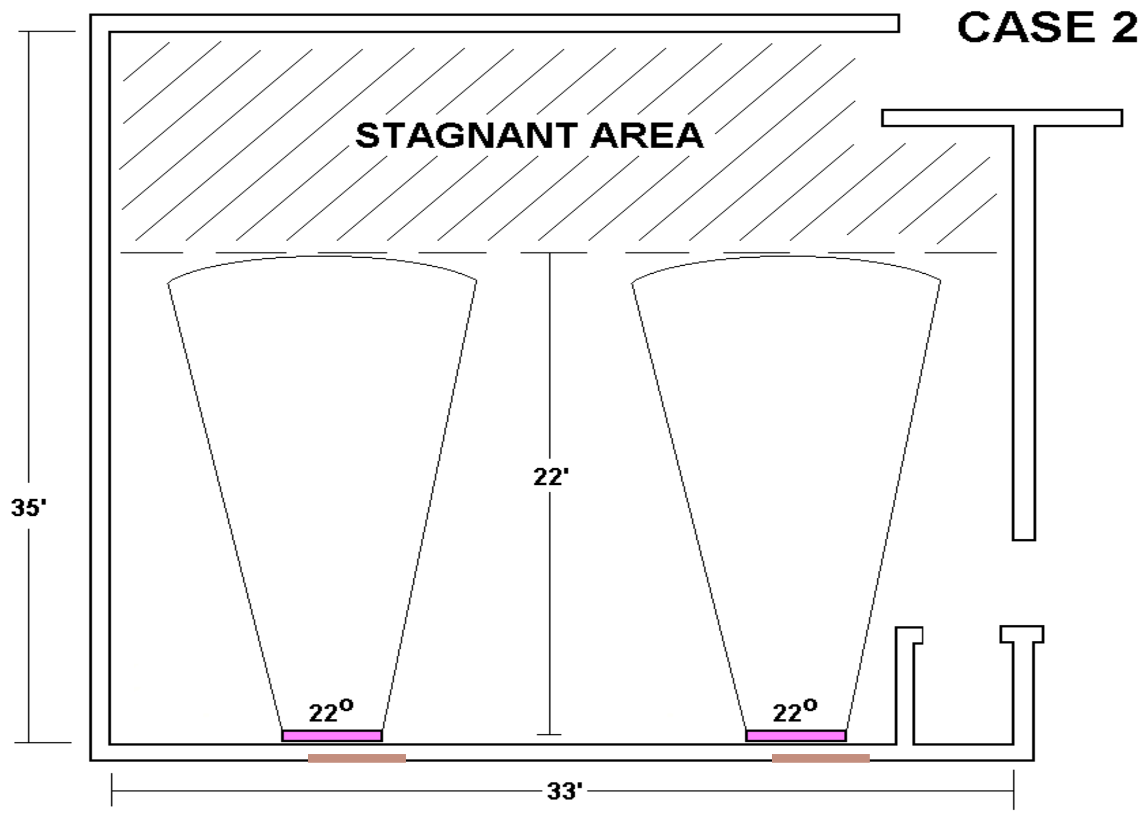
Case 4. Two HILT-48" 2-way

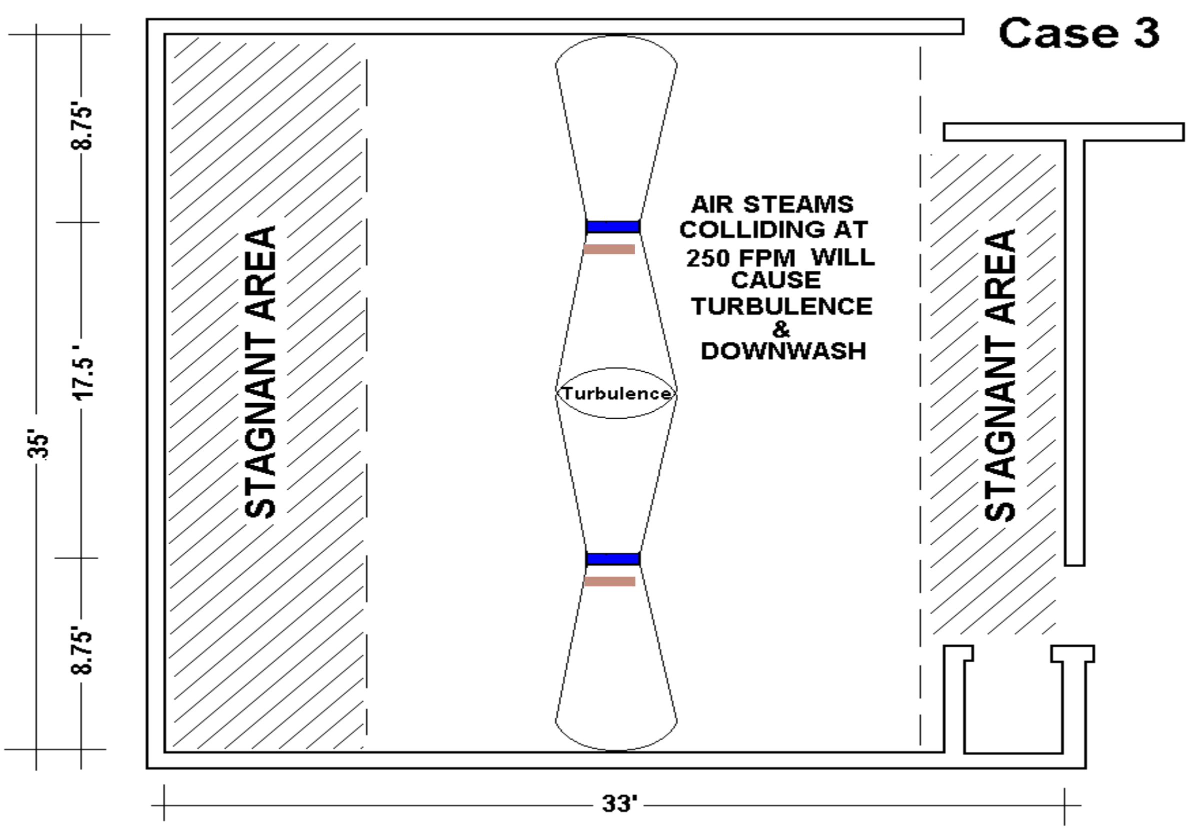
Induction Ratio 20:1
ADPI = <90 due to low induction ratio.
(ADPI will decrease further if air-supply throttles.)

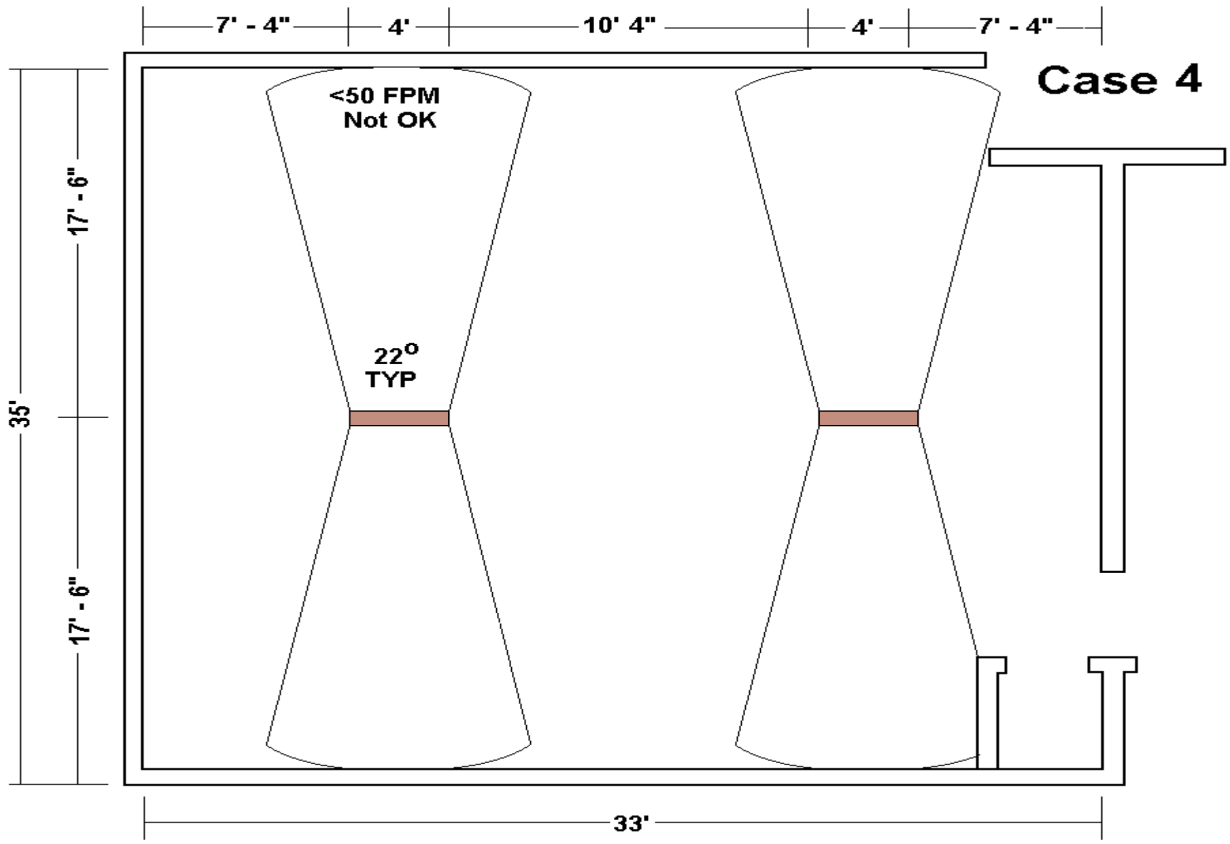
Case 5. Two HILT-24" 2-way (Parallel Configuration)

Induction Ratio 37:1
ADPI = 100 due to proper selection

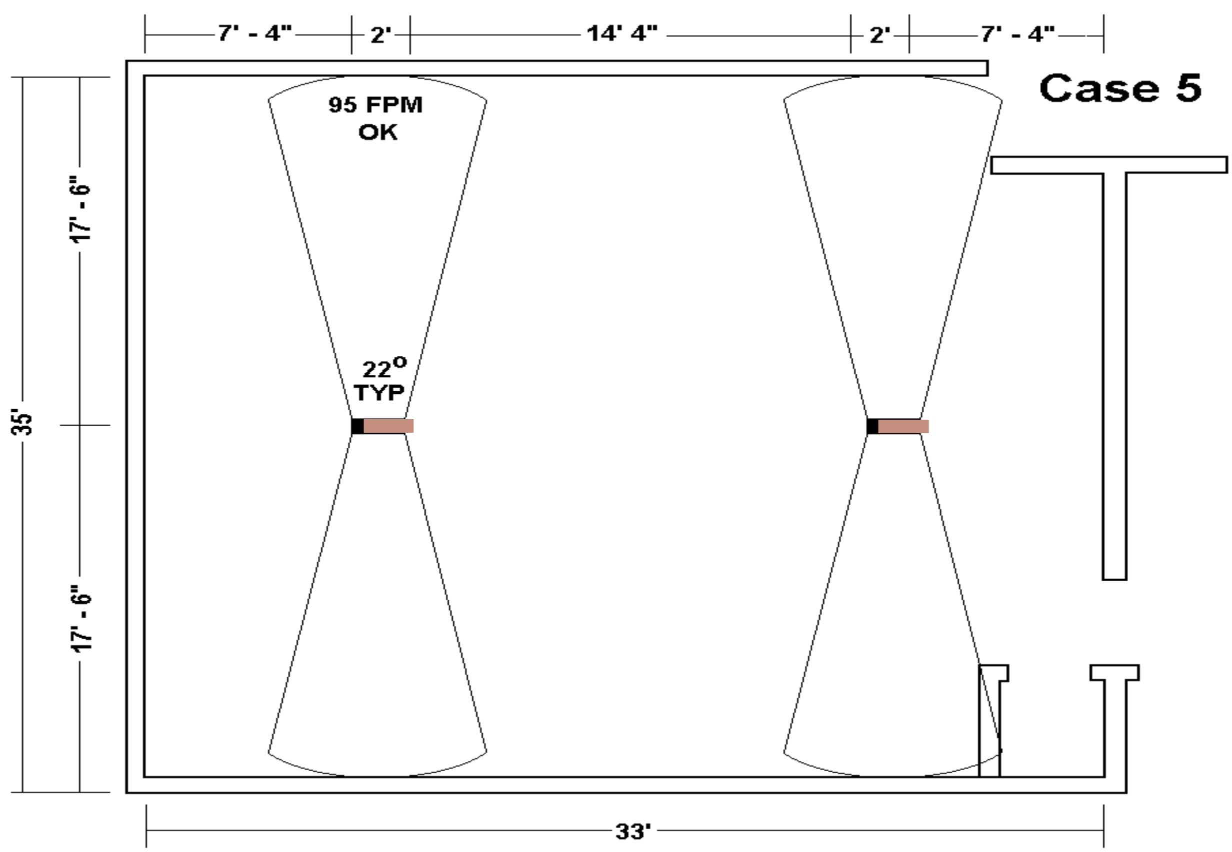



CASE 2
STAGNANT AREA
35'
22'
22°
22°
33'


Case 3
STAGNANT AREA
AIR STEAMS COLLIDING AT 250 FPM WILL CAUSE TURBULENCE & DOWNWASH
Turbulence
STAGNANT AREA
8.75'
17.5'
8.75'
35'
33'



7' - 4"
4'
10' 4"
4'
7' - 4"
Case 4
<50 FPM
Not OK
22°
TYP
35'
17' - 6"
17' - 6"
33'



7' - 4"
2'
14' 4"
2'
7' - 4"
Case 5
95 FPM
OK
22°
TYP
35'
17' - 6"
17' - 6"
33'

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